

HIGH PERFORMANCE CONCRETE QUESTIONNAIRE

Version: 7-15-03

State: Oregon

- Which of the following changes have been made to your concrete specifications in the last 10 years?

Check those that apply:

	Changes Made in Last 10 Years	Included in Current Specifications
Use HPC-low permeability concrete	X	X
Use HPC-high strength concrete		
Allow admixtures	X	X
Concrete strengths		
Bridge deck curing	X	X
Deck finishing requirements		
Limit cement/alkali content		
Testing and acceptance requirements	X	X
Heat of Hydration required for cement		
Chloride testing of hardened concrete		
Lightweight concrete		
Self-consolidating concrete (SCC) in use		
Flowing concrete in use		
Epoxy coated reinforcing steel used	X	X
Stainless Steel reinforcing steel used	X	X
Stainless clad reinforcing steel used		
Specify air void parameters (spacing factor and/or specific surface)		

- Current Concrete Specifications:

Class of Concrete	Air Content %	Max. W/C Ratio	Slump (in.)	Cement Type	Min. Cement Content (lb/cy)	Max. Cement Content (lb/cy)	Maximum Aggregate Size (in.)
Prestressed	4-7	0.40	5	I, II, III	660	None	3/4"
Decks	5	0.40		I + II	630	None	1 1/2"
Parapets							
Substr./General	4.5	0.50	4	I + II	570	None	1 1/2"
Paving	4.5	0.44	4	I + II	570	None	1 1/2"
Latex Hydraulic Cement Concrete							
Silica Fume Concrete							

Same

Highest compressive strength used for prestressed concrete girders: 9000 p.s.i.
 Compressive concrete strength used for decks: 4500 p.s.i.

3. All states have experienced some of the below concrete distresses. To what extent has your State experienced these (Rank from 1 to 5 with 1=rare and 5=often):

Type of Distress	1	2	3	4	5
Corrosion of Reinforcing Steel				X	
Sulfate Attack	X				
Alkali-silica Reactivity	X				
Freezing and Thawing		X			
Cracking (girders, substructure, pvmt)*					X
Deck Cracking (Early age < 5 years)		X			
Overload	X				
Poor Construction Quality			X		

* 1950's + 1960's vintage RCDG's

4. Construction Requirements:
 Workability Requirements:

ADMIXTURES AND SLAG USAGE					
ADMIXTURE/SLAG	Non-Aggressive Environment		Aggressive Environment		ELEMENTS WHERE USED All, D, G, P, F, CP, DS*
	YES	NO	YES	NO	
Air-Entraining	X		X		
Retarding		X		X	
Accelerating		X		X	
Water Reducing (Normal)		X		X	
Water Reducing (High Range)	X		X		D
Water Reducer + Retarder		X		X	
Water Reducer + Accelerator		X		X	
Viscosity Modifying Admixture		X		X	
Silica Fume	X		X		D
Fly Ash, Class F	X		X		D
Fly Ash, Class C	X		X		D
Fly Ash, Class N	X		X		D
Metakaolin		X		X	
Rice Hull Ash		X		X	
Other Ash Materials		X		X	

Bark Ash		X		X	
Bottom Ash		X		X	
Pet Coke Ash		X		X	
Slag		X		X	
Latex		X		X	
Corrosion Inhibitors		X		X	

*Key: Deck(D); Girder(G); Pier(P); Footing(F); Concrete Pile(CP); Drilled Shaft(DS)

ADMIXTURE TYPE & SLAG	RANGE % (Wt. Of Cement Replaced)
Fly Ash	30%
Slag	—
Silica Fume	4%
Metakaolin	—
Rice Hull Ash	—
Other Ash Materials	—

	Yes	No
Is water allowed to be added at the job site?	_____	_____X_____
Are air-entraining admixtures allowed to be added at the job site?	_____	_____X_____
Are accelerators added at the job site?	_____	_____X_____
Are there any special finishing requirements?	_____	_____X_____
Explain: _____		

Are there any time constraints between finishing and applying curing? _____X_____

Explain: (Minimum and Maximum Times) Immediately after finishing and texturing. Fogging should occur between placement and texturing.

Curing Blanket

CURING REQUIREMENTS						
Structural Element	Exist. Spec. Y/N	Curing Comp. Y/N	Fog Mist Y/N	Wet Burlap Duration	ERL LB/SF/HR	Cure Time (Days)
Deck	Y	N	Y	14	0.20	14
SF Overlay	Y	N	N	7	0.15	7
Latex Conc. Overlay	Y	N	N	7	0.15	7
Dense Conc. Overlay						
Paving						
Shotcrete						
Shotcrete With SF						
Massive Element						

Key : ERL= Evaporation Rate Limit (LBS/SF/HR)

Any construction requirements for reducing evaporation?

Yes X No _____

How and how often is evaporation rate measured? *Measurements are taken from locally available data (source varies) and are only measured at beginning of pour*

5. Has fiber-reinforced concrete been specified for bridge decks or overlays and paving (either steel or plastic fibers)(Indicate R = Regular and E = Experimental.)

Bridge decks: Yes _____ No X Fiber Type _____
 Overlays: Yes _____ No X Fiber Type _____
 Paving: Yes _____ No X Fiber Type _____

6. Identify concrete cover requirements:

MINIMUM CONCRETE COVER REQUIREMENTS		
STRUCTURAL ELEMENT	COVER (in.)	
	Non-Aggressive Environment	Aggressive Environment
Decks – Top	2.5"	2.5"
Decks – Bottom	1.5"	2.0"
Reinforced Concrete Beams	2.0"	2.0"
Prestressed Concrete Beams - CIP	↓	↓
Prestressed Concrete Beams - Precast		
Substructure – Piers		
Substructure – Abutments		
Substructure - Footings	↓	↓

REQUIRED REINFORCING STEEL			
STRUCTURAL ELEMENT	TYPE REINFORCING STEEL BS, ECS, GS, SS, SCD, MMFX		
	Non-Aggressive Environment	Aggressive Environment	Experimental Use Only
Decks – Top	BS	ECS or SS	
Decks – Bottom		ECS or SS	
Reinforced Concrete Beams		ECS or BS	
Prestressed Concrete Beams, CIP		ECS or BS	
Prestressed Concrete Beams, Precast		ECS or BS	
Substructure – Piers		BS	
Substructure – Abutments		BS	
Substructure – Footings		BS	

Key: BS = Black Reinforcing Steel; ECS = Epoxy Coated Reinforcing Steel; GS = Galvanized Reinforcing Steel; SS = Stainless Reinforcing Steel; SCD = Stainless Clad Reinforcing Steel; MMFX = MMFX Microcomposite Steel Rebar

7. Is there a limit on the percent of alkali allowed in the cement?

Yes _____

No X

8. Are aggregates tested for reactivity?

Yes _____

No X

How many sources of aggregates?

9. Indicate specification permeability requirement limits for:

Structural Element	Coulombs	
	Non-Aggressive Environment	Aggressive Environment
Bridge Decks	None	None
Prestressed Concrete Members	↓	↓
Substructure Elements		
Pavements		

10 (a): What QC/QA tests do you specify?

Fresh Concrete		Hardened Concrete	
	Tests		Tests
Slump	T119	Compressive Strength	T22
Spread	_____	Air/Void System	_____
Unit Weight	T121	Chloride Permeability	T277
Air Content	T152	Maturity	_____
Water Content		Freeze/Thaw	_____
W/CM	Modified T121	Shrinkage	_____
		ASR	_____

10 (b): What are your acceptance criteria for cracks?

Engineer acceptance

10 (c): Do you specify pre-construction mock-ups?

If yes, provide details.

10 (d): Do you specify design properties at 28 days or 56 days or some other duration?

28 days

10 (e): Do you allow 4x8 cylinders for compressive strength tests?

Yes

10 (f): What types of end-caps do you specify/allow – Sulfur, Neoprene, Ground Ends?

Allow all three. Internally, we use sulfur.

10 (g): Do you specify match-cured cylinders?

No

10 (h): How do you enforce/monitor wet-water curing?

Agency Inspection

10 (i): Do you require warranties against defects – e.g. bridge deck cracking?

If yes, provide details.

No

10 (j): What is your experience/evaluation/specification regarding the Microwave Test for w/cm?

None

11. How often are the following types of concrete overlays used? (Rank from 1 to 5 with 1=rare and 5=often)

Type of Overlay	1	2	3	4	5	Comment on Performance E, G, or P**
Latex-modified Concrete	X					
Silica Fume Concrete					X	
Dense Concrete						
Fly Ash Concrete						
Slag Concrete						
Epoxy (Thin Bonded)	X					
Polymer (Thin Bonded)	X					
Other						

**Key: Excellent(E); Good(G); Poor(P)

12. Rank the need or interest for your State to learn more about the following from 1 to 5 (1=low; 5=very high)

BENEFICIAL ATTRIBUTES	1	2	3	4	5	Overall Ranking (1-11)
Low Permeability (Dense Concrete)					X	2
High Durability					X	1
High Corrosion Resistance				X		3
Alkali-silica Reactivity Resistance		X				12
Higher Concrete Strengths			X			5
Highly Flowable Concrete		X				13
Crack Control				X		4
Skid Resistance		X				
Rideability		X				8
Toughness of Concrete*		X				9
Minimum Maintenance		X				10
Longer Service Life			X			6
Savings (Life Cycle Costs)			X			7

*Add fibers: steel, glass, plastic, polypropylene, etc.

13. Who at State and Division levels i.e., Materials, Construction, Pavement, Research, Structures, would be involved in examining concrete specifications and procedures and learning about High Performance Concrete?

Check those that apply:

Materials X
Construction
Pavement X
Structures X
Research

14. Have you considered adopting/implementing the following SHRP products?

2005 A Guide to Determining the Optimal Gradation of Concrete Aggregates?
Yes No Unknown X Implemented

2014 Specifications for High Performance Concrete?
Yes X No Unknown Implemented

2017 Designing ASR-Safe concrete Mix?
Yes No X Unknown Implemented

2036 Manual for Bridge Rehabilitation and Protection
Yes X No Unknown Implemented

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Thank you for completing the questionnaire. A summary of compiled results will be made available upon completion.